

Examining Moderating Effects of Social Emotional Learning Factors on Achievement Gains

Yi-Lung Kuo, PhD, Alex Casillas, PhD, and Jeff Allen, PhD

Abstract

This study investigated the moderating roles of motivation, social engagement, and self-regulation in predicting academic achievement in grades 11-12 for 3,281 7th-9th graders. Standardized assessments of college readiness (ACT® Explore and the ACT® test) and student self-report measures of social emotional learning factors (ACT® Engage® Grades 6-9) were used in the study. The results showed that females in grades 7-9 scored higher than males for motivation and self-regulation. Motivation and social engagement moderated prior achievement in predicting later achievement in grades 11-12, while self-regulation moderated both gender and prior achievement in predicting later achievement. Specifically, among female students, effects were positive for females with higher prior achievement ($PR \geq 95$) and negative for females with lower prior achievement ($PR \leq 5$) for self-regulation in predicting achievement in grades 11-12.

Introduction

Social emotional learning (SEL) factors, such as motivation, social engagement, and self-regulation, play key roles in classroom learning (Zins, Bloodworth, Weissberg, & Walberg, 2007). Motivation refers to self-regulatory mechanism to achieve academic success via certain personality characteristics and attitudes, such as Academic Discipline, Commitment to School, and Optimism. Social engagement refers to students' perception of their family's engagement, particularly family members' attitudes regarding the value of education and their involvement in school activities, relationships with school personnel, and perception of school safety climate. Self-regulation refers to the degree to which students appropriately regulate and express their feelings and behaviors, as well as how they think about the consequences of behavior in school contexts. Students need to

be highly motivated to learn well in school, to recognize and use the social supports that can facilitate their learning, and to regulate their behaviors and manage their feelings. From a broader perspective, SEL factors and prior academic achievement have been demonstrated to predict later achievement in both K-12 and higher education settings (e.g., Casillas et al., 2012; Poropat, 2009). However, it is unclear how SEL factors interact with prior academic achievement and gender when predicting subsequent academic achievement.

In educational contexts, the Matthew Effect is one theory for explaining why the variability of achievement and ability increases over time, which leads to a widening gap between high-achieving and low-achieving students. (e.g., Ceci & Papierno, 2005). For example, Walberg and Tsai (1983) conducted a longitudinal study through National



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Assessment of Educational Progress and found that prior educational background, current educational experience, and motivation significantly predict academic achievement individually and together, while the cumulating advantageous effects of these three factors were evidenced in the prediction models. Stated differently, students possessing better prior educational background tend to have better educational experience and be motivated to learn. Furthermore, the cumulative advantages of these factors show predictive power for later academic outcomes. Consequently, the achievement gap is widening over time due to students' increasing differences in educational backgrounds. Although middle school students are not directly represented in past studies, it seems reasonable to hypothesize that high-achieving middle school students may benefit more over time in achievement from particular SEL factors than low-achieving students.

The purpose of this study is to investigate the roles played by SEL factors and gender in predicting academic achievement in grades 11-12 among 7th-9th-grade students. Specifically, the differential effects of SEL factors for students who differed in academic achievement and gender were examined. The research questions of this study were:

1. Do male and female 7th-9th graders differ on SEL characteristics?
2. Do students' SEL factors interact with gender and prior academic achievement in the prediction of achievement in grades 11-12? Does the Matthew Effect take place as SEL factors interact with prior academic achievement?

Method

Database

To assess the full range of students' SEL factors and academic achievement, an ACT longitudinal database was used. This database was designed for the purpose of development and validation of Engage Grades 6-9, a self-report measure of students' SEL factors related to academic performance and persistence. The students in the database were initially recruited from 24 middle schools in 13 districts showing a broad range of student demographic and achievement variability, had used the ACT Explore academic achievement test, and agreed to provide follow-up data as the students progressed through high school (ACT, 2011).

Participants

Students were included based on three criteria: (a) students took an assessment of SEL factors (ACT Engage Grades 6-9) while in grade 7, 8, or 9; (b) students took college readiness assessments in grade 7, 8, or 9 (ACT Explore) and grade 11 or 12 (the ACT test), and (c) students' responses in the SEL assessment were not flagged for insufficient item response variability or response inconsistency. The sample consisted of 3,281 students, 3% of whom took the assessment of SEL factors in 7th grade, 59% in 8th grade, and 38% in 9th grade. Approximately half of the students were female (55%) and predominantly White (43%), with the remaining racial/ethnic breakdown being: 22% Hispanic/Latino, 23% African American, 5% Multiracial, 2% American Indian/Alaskan Native, 2% Asian American/Pacific Islander, and 3% of another race/ethnicity or preferred not to respond.

Measures

SEL. ACT Engage Grades 6-9 includes nine scales using 6-point Likert-type items (1 = *Disagree a Lot* and 6 = *Agree a Lot*) and one scale (Orderly Conduct) using a binary response format (1 = Yes and 0 = No). The 10 scales show moderate to high internal reliabilities ($\alpha = .81 - .90$, $Mdn = .87$; ACT, 2011). The SEL scales were grouped into three higher-order SEL factors used in the study: Motivation (consisting of Academic Discipline, Commitment to School, and Optimism), Social Engagement (consisting of Family Attitude toward Education and Family Involvement, Relationships with School Personnel, and School Safety Climate), and Self-Regulation (consisting of Managing Feelings, Orderly Conduct, and Thinking before Acting).

Academic achievement. Composite scores from ACT Explore and the ACT were used as estimates of students' overall academic achievement at two points in time. Although using Composite scores eliminates the ability to explore relationships for particular subject areas (e.g., English, mathematics, reading, and science), they provide a general proxy on academic achievement. Scale scores for Explore and the ACT are comparable and could be measured on the same scale to facilitate longitudinal comparisons (ACT, 2013, 2014).

Data Analyses

Given unequal item numbers and different item formats of Engage scales, raw mean scale scores were first linearly transformed to new scale scores ranging from 10 to 60. After obtaining Engage scale scores on the common score range, the unit weights

method was applied to sum the scores to form aggregate scores for three SEL factors: motivation, social engagement, and self-regulation. The aggregate SEL scores and students' Explore and ACT Composite scores were transformed to z-scores for the following analyses. The dichotomous gender variable (males = 1 and females = 0) was not standardized. Further, those standardized SEL scores that were three standard deviations below the mean were considered outliers and removed from further analyses. As a result, 1.3% ($n = 43$), .5% ($n = 16$), and .1% ($n = 3$) of motivation, social engagement, and self-regulation scores, respectively, were removed.

In response to research question 1, comparisons between male and female students in grades 7-9 were conducted using independent-sample Student's t-tests for each SEL factor. The effect size (Cohen's d) was also estimated. In response to the research question 2, multiple linear regression models were run to test the hypotheses that each SEL factor moderates gender and prior academic achievement in the prediction of later achievement. Post hoc probing techniques were used if significant interaction terms were found.

Results

Gender Differences in SEL Factors

Table 1 shows that female students tended to outperform male students on motivation and self-regulation. The effect size for gender differences were small for motivation ($d = .20$), social engagement ($d = .03$), and self-regulation ($d = .24$).

Table 1. Comparison of SEL Factors across Male and Female Students in Grades 7-9

SEL	Females	Males	t	df	Cohen's d
Motivation	52.34	51.31			
Female (n = 1,779)	(5.10)	(5.31)	5.57***	3208	.20
Male (n = 1,431)					
Social Engagement	45.41	45.23			
Female (n = 1,786)	(6.37)	(6.07)	.80	3234	.03
Male (n = 1,450)					
Self-Regulation	42.98	40.71			
Female (n = 1,793)	(9.45)	(9.01)	6.97***	3246	.24
Male (n = 1,455)					

Moderating Effects of SEL Factors

Motivation. Table 2 and Figure 1 show that the relationships between prior and later achievement as moderated by motivation. The two-way interaction terms between prior achievement and motivation in predicting later achievement were statistically significant ($B = .040$, $p < .001$). For high-achieving students (i.e., scores in prior academic achievement are $PR \geq 95$), the slope is

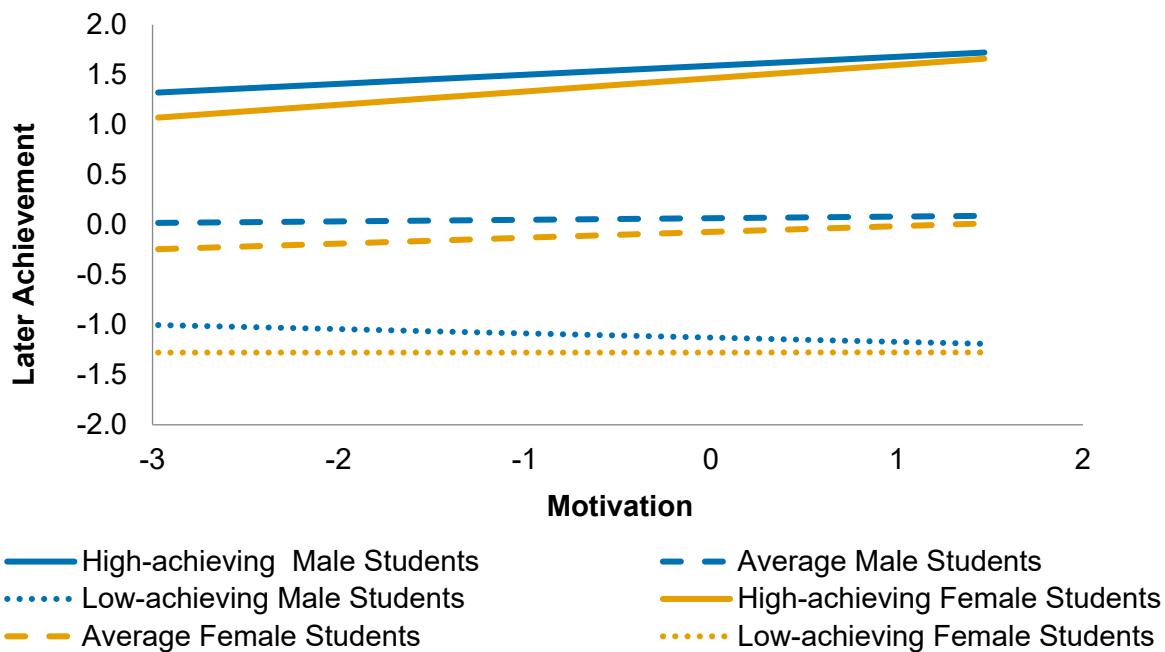
slightly positive, whereas for low-achieving students (i.e., scores in prior academic achievement are $PR \leq 5$), the slope is slightly negative. That is, as motivation increased, regardless of gender, the difference of later academic achievement generally widened. The results followed the pattern we expected. Additionally, motivation provided a slight contribution beyond gender and prior achievement scores in predicting later achievement ($\Delta R^2 = .003$).

Table 2. Moderating Effects of Motivation

	Model 1		Model 2	
	B	SE	B	SE
Intercept	-.059***	.013	-.072***	.013
Gender	.129***	.020	.138***	.020
Explore	.845***	.014	.831***	.014
Gender × Explore	-.024	.020	-.007	.020
Motivation			.058***	.015
Gender × Motivation			-.043	.022
Explore × Motivation			.040***	.010
Model R^2	.6896	.6926		
ΔR^2			.003	

$n = 3,210$. *** $p < .001$

Figure 1. Moderating Effects of Motivation and Later Academic Achievement at Low, Average, and High Scores



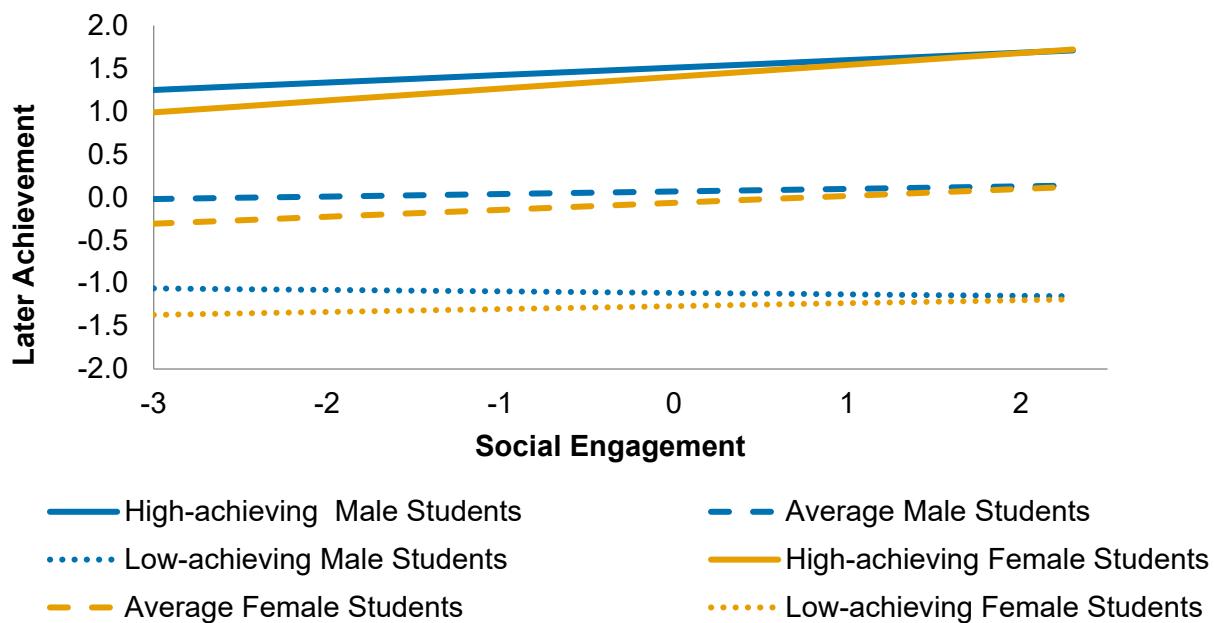
Social engagement. Table 3 and Figure 2 show the relationships between prior and later achievement as moderated by social engagement in predicting later achievement ($B = .032, p < .01$), and the two-way moderation effects are illustrated in Figure 2. In the prediction of later achievement, the findings suggest that high-achieving students benefit more from higher social control, whereas low-achieving students do not; this is regardless of gender. Similar to findings in motivation, as social engagement increased, high achieving students experienced more growth in general than low-achieving students. Overall, social engagement provided incremental contribution beyond gender and prior achievement scores in predicting later achievement ($\Delta R^2 = .005$).

Table 3. Moderating Effects of Social Engagement

	Model 1		Model 2	
	B	SE	B	SE
Intercept	-.058***	.013	-.065***	.013
Gender	.129***	.020	.133***	.020
Explore	.844***	.014	.829***	.014
Gender × Explore	-.026	.020	-.015	.020
Social Engagement			.081***	.013
Gender × Social Engagement			-.051*	.020
Explore × Social Engagement			.032**	.010
Model R^2	.6895		.6944	
ΔR^2			.0049	

$N = 3,236$. * $p < .05$ (two-tailed). ** $p < .01$ (two-tailed). *** $p < .001$

Figure 2. Moderating Effects of Social Engagement and Later Academic Achievement at Low, Average, and High Scores



Self-regulation. Table 4 and Figure 3 show the relationships between prior and later achievement as moderated by gender and self-regulation in predicting later achievement ($B = -.061$, $p < .01$). Self-regulation provided larger incremental contribution beyond gender and prior achievement scores in predicting later achievement ($\Delta R^2 = .0076$). Table 5 shows that the slope of high-achieving female students significantly differed from high-achieving male students in predicting later achievement. In addition, the slopes of high- and low-achieving female students were significantly different. That is, as self-regulation increased, effects of prior achievement on later achievement increased for female students. To that end, among female students, the Matthew Effect was evident.

Table 4. Moderating Effects of Self-Regulation

	Model 1		Model 2	
	B	SE	B	SE
Intercept	-.057***	.013	-.085***	.013
Gender	.129***	.020	.160***	.020
Explore	.844***	.013	.801***	.014
Gender × Explore	-.027	.020	.005	.020
Self-regulation			.086***	.013
Gender × Self-regulation			-.043*	.020
Explore × Self-regulation			.078***	.014
Gender × Explore × Self-regulation			-.061**	.020
Model R^2	.6896		.6972	
ΔR^2			.0076	

$N = 3,248$. * $p < .05$, ** $p < .01$, *** $p < .001$

Figure 3. Moderating Effects of Self-Regulation, Gender and Later Academic Achievement at Low, Average, and High Scores

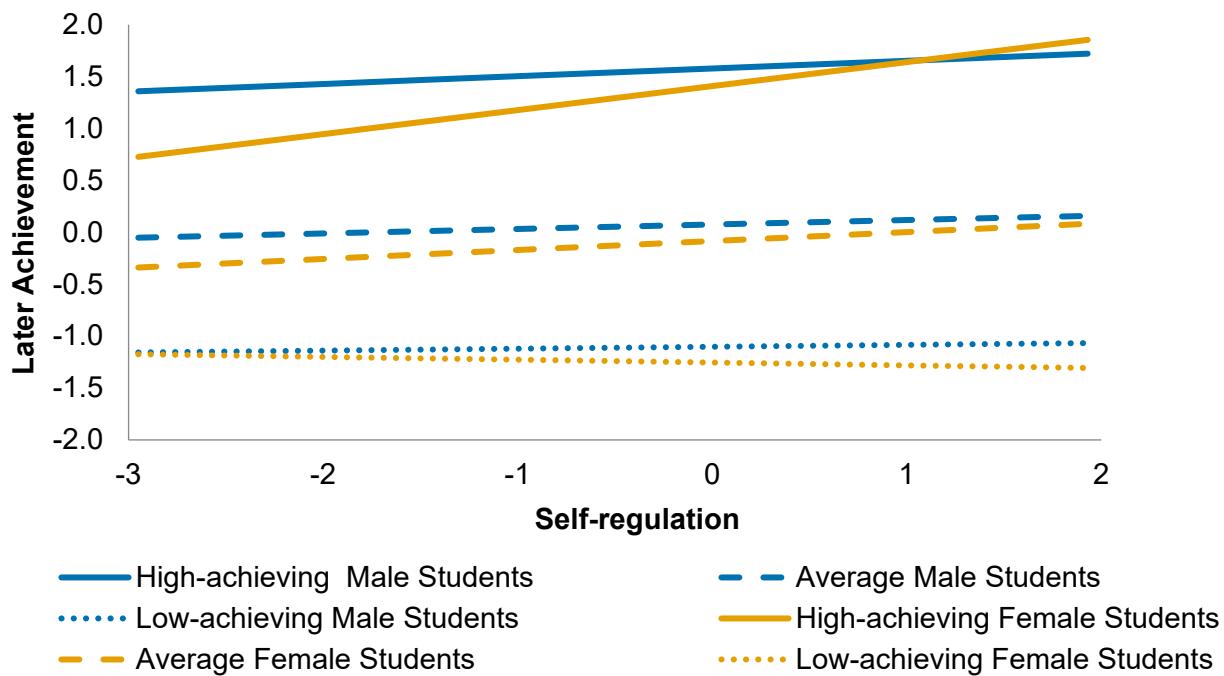


Table 5. Tests of Simple Slopes of Later Academic Achievement on Self-regulation

Group	Slope Differences	SE _{contrast}	t	Bonferroni's p
High-Achieving Male vs. High-Achieving Female	-.16	.04	-3.68*	< .001
Low-Achieving Male vs. Low-Achieving Female	.05	.04	1.31	.048
High-Achieving Male vs. Low-Achieving Male	.06	.05	1.14	.063
High-Achieving Female vs. Low-Achieving Female	.26	.05	5.78*	< .001

N = 3,248. Slope difference tests were conducted based on Dawson and Richter's (2006) work. The Bonferroni correction was applied to maintain a family-wise alpha level of .05 through four slope differences tests. * $p < .013$

Conclusion

A large cohort of students was studied in this four-year longitudinal study. The contribution of this study was to explain how student SEL factors, including motivation, social engagement, and self-regulation, interact with middle school academic achievement and gender when predicting later academic achievement in high school. Two research questions were examined: (1) Do male and female students in grades 7-9 differ on SEL characteristics? (2) Do students' SEL factors interact with gender and prior academic achievement in the prediction of achievement in grades 11-12? The results showed that females scored higher than males for motivation and self-regulation. Further, all three SEL factors showed slight incremental contribution (less than 1%) beyond gender and prior achievement. In predicting later academic achievement, positive effects of motivation and social engagement were observed for students with higher prior achievement, regardless of gender. However, positive effects of self-regulation were only observed for female students with higher prior achievement. Generally, the Matthew Effect was evident for all three SEL factors. In particular, the effect was found with gender differences being present in self-regulation.

The students' SEL skills in this study were assessed through self-ratings, which have known measurement issues such as self-rating biases, social desirability, and others (Kyllonen, 2005; Paulhus, 1984). In addition, Paulhus (1984) argued that an individual might engage in self-deception or impression management when responding to self-report items. Individuals engaging in self-deception actually believe their positive self-reports. Individuals engaging in impression management respond to items in ways that

would present themselves positively to others. In this study, it is possible that low-achieving male students may have rated themselves highly on SEL factors (i.e., motivation and social engagement) due to either self-deception or impression management.

An alternative explanation for possible biases is that individuals respond to items by comparing their SEL skills to their peers with similarly low achievement (Kyllonen, 2005). In this context, low-achieving students might perceive "high" SEL factors. This is why psychosocial assessments are generally considered to be low-stakes and are seen as less suitable as the sole criterion for selection and other high-stakes purposes. Using fake-resistant psychosocial assessments (e.g., situational judgment tests), others' ratings (e.g., collecting objective behavioral data from institutional records, teachers, or counselors), and forced choice methods have been documented in the literature as feasible ways to minimize the aforementioned measurement problems and biases.

Implications

Snow, Corno, and Jackson (1996) argued that affective (e.g., emotion), conative (e.g., motivation), and cognitive individual differences should be considered simultaneously when predicting students' scholastic performance and vice versa. Inspired by Snow's legacy on the cognitive-affective-conative triad (a.k.a., aptitude complexes) for underscoring the interaction among the complexes to explain student learning outcomes (Corno, et al., 2002), current findings suggest that students' SEL factors only demonstrate positive influences on high school academic performance if students have built a foundational knowledge base in middle school. In other words, low-

achieving students in middle school have a lower likelihood of achieving college readiness regardless of their levels of SEL factors. Therefore, teachers should recognize that SEL factors come into play in increasing students' academic achievement in high school only after they have achieved a foundational level of knowledge and skills in middle school.

The students in this study exhibited a wide range of achievement and SEL scores suggesting that differentiated interventions in the classroom are needed to meet their individual needs. For example, a meta-analysis that examined universal school-based social-emotional development programs (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011) found that SEL interventions that include programming that is *Sequenced* (programs with a connected and coordinated set of activities), *Active* (active forms of learning), *Focused* (programs having components to develop personal or social skills), and *Explicit* (programs targeting on specific SEL skills) result in multiple positive outcomes in terms of SEL skills, attitude, emotions, behaviors, and subsequent academic performance. Similarly, evidence from response to intervention (RTI) programs suggests that SEL programming at each tier (universal, targeted, or intensive) results in positive behavior changes and improved academic outcomes. Examples of these programs include Check & Connect, Check-In/Check-Out, Safe & Civil Schools Foundations, and many others (Hoyle, Marshall, & Yell, 2011; Maggin, Zurheide, Pickett, & Baillie, 2015; Medigan, Cross, Smolkowski, & Strycker, 2016). Durlak et al. (2011) suggested that students' performance

on SEL can serve as references for educators to design further educational interventions.

Finally, when referring to educational accountability, policymakers have recently recognized that both cognitive and SEL skills matter. This study adds to the growing discussion on how to leverage efforts to develop accountability systems that integrate SEL factors, such as the development of standards, assessments, and curriculum focused on SEL, as well as a more holistic approach that integrates core academic knowledge and skills, SEL/behavioral skills, and education and career navigation in K-12 programs.

Future Research

Examining narrow SEL characteristics is suggested as a next step. It is hypothesized that Academic Discipline may play a more prominent role in predicting later academic achievement, whereas the other two SEL characteristics that comprised the motivation construct in this study (Commitment to School and Optimism) may have a smaller contribution.

We pursued gender differences because this finding has been seen in the literature before. However, as we focus on gaining a clearer understanding of how to close achievement gaps, we need to examine other potential moderators including: race/ethnicity, socioeconomic status levels, first-generation college student status, and other characteristics that are implicated in the literature in relation to achievement gaps.

References

- ACT. (2011). *ACT Engage Grades 6-9 user's guide*. Iowa City, IA: ACT.
- ACT. (2013). *Explore technical manual*. Iowa City, IA: ACT.
- ACT. (2014). *The ACT technical manual*. Iowa City, IA: ACT.
- Casillas, A., Robbins, S., Allen, J., Kuo, Y. L., Hanson, M. A., & Schmeiser, C. (2012). Predicting early academic failure in high school from prior academic achievement, psychosocial characteristics, and behavior. *Journal of Educational Psychology, 104*(2), 407-420. doi:10.1037/a0027180
- Ceci, S. J. & Papierno, P. B. (2005). The rhetoric and reality of gap closing: When the "have-nots" gain but the "haves" gain even more. *American Psychologist, 60*(2), 149-160. doi:10.1037/0003-066X.60.2.149
- Corno, L., Cronbach, L. J., Kupermintz, H., Lohman, D. F., Mandinach, E. B., Porteus, A. W., & Talbert, J. (2002). *Remaking the concept of aptitude: Extending the legacy of Richard E. Snow*. Hillsdale, NJ: Erlbaum.
- Dawson, J. F., & Richter, A. W. (2006). Probing three-way interactions in moderated multiple regression: Development and application of a slope difference test. *Journal of Applied Psychology, 91*(4), 917-926. doi: 10.1037/0021-9010.91.4.917
- Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child Development, 82*(1), 405-432. doi:10.1111/j.1467-8624.2010.01564.x
- Hoyle, C. G., Marshall, K. J., & Yell, M. L. (2011). Positive behavior supports: Tier 2 interventions in middle schools. *Preventing School Failure, 55*(3), 164-170. doi:10.1080/1045988X.2010.503975
- Kyllonen, P. C. (2005). *The case for noncognitive assessments*. R & D Connections (pp. 1-7). Retrieved from: http://www.ets.org/Media/Research/pdf/RD_Connections3.pdf
- Maggin, D. M., Zurheide, J., Pickett, K. C., & Baillie, S. J. (2015). A systematic evidence review of the Check-In/Check-Out program for reducing student challenging behaviors. *Journal of Positive Behavior Interventions, 17*(4), 197-208. doi:10.1177/1098300715573630
- Medigan, K., Cross, R. W., Smolkowski, K., & Strycker, L. A. (2016). Association between schoolwide positive behavioural interventions and supports and academic achievement: a 9-year evaluation. *Educational Research and Evaluation, 22*(7-8), 402-421. doi:10.1080/13803611.2016.1256783
- Paulhus, D. L. (1984). Two-component models of socially desirable responding. *Journal of Personality and Social Psychology, 46*(3), 598-609. doi:10.1037/0022-3514.46.3.598
- Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin, 135*(2), 322-338. doi: 10.1037/a0014996

- Snow, R. E., Corno, L. & Jackson, D., III. (1996). Individual differences in affective and conative functions. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 243-310). New York, NY: Simon & Schuster Macmillan.
- Walberg, H. J., & Tsai, S. (1983). Matthew effects in education. *American Educational Research Journal*, 20(3), 359-373.
- Zins, J. E., Bloodworth, M. R., Weissberg, R. P., & Walberg, H. J. (2007). The scientific base linking social and emotional learning to school success. *Journal of Educational and Psychological Consultation*, 17(2&3), 191-210. doi:10.1080/1047441070141314

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